MULTI-TIERED SYSTEMS OF SUPPORTS: AN INVESTIGATIVE STUDY OF THEIR IMPACT ON THIRD GRADE READING TEST SCORES IN AN URBAN DISTRICT

BY

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ABSTRACT

This study analyzed the impact of implementing response to intervention (RTI), a three-tiered system of intervention of increasing intensity, in this case for reading, schoolwide in 32 elementary schools. When a three-tiered framework is applied schoolwide, with all students and addressing academic and/or behavioral curricular instruction, it is often termed a *multi-tiered system of supports* (MTSS). Analyzing 3rd grade reading school mean scale scores on the Texas Assessment of Knowledge and Skills (TAKS) over a six-year period, this study examined performance on TAKS before and after implementation of MTSS/RTI and in comparison to a set of 30 demographically and geographically similar schools where MTSS/RTI was not being implemented during the same time period. Specifically, this comparative, interrupted time-series design tested for effects in school outcomes overall and for students receiving special education. Analyses suggest early positive effects of implementation on overall third grade reading scale scores. However, results for students who have exceptionalities are disconcerting. Results also suggest a need for replication studies to further analyze effects on outcomes following implementation for other subgroups, such as English Language Learners (ELLs), and a need to analyze data using multi-level modeling to further examine student improvement within these and other schools implementing MTSS/RTI. The findings from the current study are important for implementers and researchers associated with large, urban school systems implementing MTSS/RTI. This study expands the evidence base on MTSS implementation and provides school leaders, researchers, and policymakers with empirical evidence to consider regarding implementation effects of MTSS/RTI.

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CHAPTER 1: Introduction and Review of the Literature

The number of students, many from culturally, economically, and linguistically diverse groups, failing to achieve in school is troubling (Darling-Hammond, 2010). The recent trend of school, district, and states incorporating a multi-tiered system of supports (MTSS) and/or response to intervention (RTI) frameworks represents their efforts to prevent academic and behavioral failure (Hoover & Love, 2011). Many suggest MTSS/RTI has the potential to prevent future deficits in content area knowledge, such as reading and math, and to promote positive social-emotional and behavioral development for all students (Fuchs & Deshler, 2007; Gersten, Compton, Connor, Dimino, Santoro, Linan-Thompson, & Tilly, 2008; Justice, 2006; Klingner & Edwards, 2006; McIntosh, Filter, Bennett, Ryan, & Sugai, 2010; Newman-Gonchar, Clarke, & Gersten, 2009). Further, research suggests that the implementation of MTSS/RTI may decrease the number of students identified for special education, namely learning disabilities, as a result of inadequate response to instruction (Snow, Burns, & Griffin, 1998; Vaughn & Fuchs, 2003; Wanzek & Vaughn, 2011). Practitioners and researchers have also suggested MTSS may reduce the number of children identified as having a learning disability when their academic difficulty is actually due to cultural differences or lack of adequate instruction (Cortiella, 2005); however, a robust analysis of student referral and special education placement has not yet occurred to justify this claim. Given the potential for MTSS frameworks incorporating RTI to improve overall student success, the topic warrants further study.

The majority of the empirical evidence research supporting RTI implementation, intervention, and instruction published since 1997, when the concept was first implied in special education law, has focused on early reading (Fuchs & Deshler, 2007; Gersten, et al, 2008;

Lemons, Key, Fuchs, Yoder, Fuchs, Compton, Williams, & Bouton, 2010). More recently, a RTI framework has been applied to other content areas and grade levels (Bender, 2008; Bryant, Bryant, Gersten, Scammacca, Funk, & Winter, 2008; Canter, Klotz, & Cowan, 2008; Clark & Shinn, 2004). Further, the study of RTI has focused primarily on expanding the evidence base for the interventions and instruction provided to all students, providing understanding of its use for special education identification, and sharing the procedures and processes (e.g. professional development) that have been found effective in school, district, and states implementing the framework (Calendar, 2007; Denton, Vaughn, & Fletcher, 2003; Hattie, Biggs, & Purdie, 1996; Swanson & Hoskyn, 1998; Vaughn & Chard, 2006; Vaughn, Linan-Thompson, Woodruff, Murray, Wanzek, Scammacca, Roberts, & Elbaum, 2008). Currently, less is known of the effects of large-scale implementation of MTSS/RTI (VanDerHeyden, Witt, Gilbertson, 2007) and some researchers are critical of framework and the impact for students with disabilities (Ferri, 2011). The purpose of this study was to analyze the impact of implementing MTSS/RTI on academic outcomes for all students, especially students receiving special education, on a large scale. This study was designed to address the paucity of existing information by analyzing an urban, large-scale implementation of MTSS/RTI for reading. Although the results of this study suggest that large-scale MTSS/RTI implementation benefits students, even more evidence is needed to support continued implementation and scale-up efforts. This is especially important for students receiving special education supports, as the literature in the relatively young field is currently insufficient to produce a robust, firm research base.

Review of the Literature

The focus on MTSS/RTI implementation has matured in research and practice over the last decade. The frameworks and systems have taken center stage for preventing and identifying

specific learning disabilities, while at the same time initiating organizational changes within educational institutions. The literature that follows is a snapshot of the current understanding of MTSS/RTI frameworks, practices, and implementation.

MTSS/RTI Essential Components

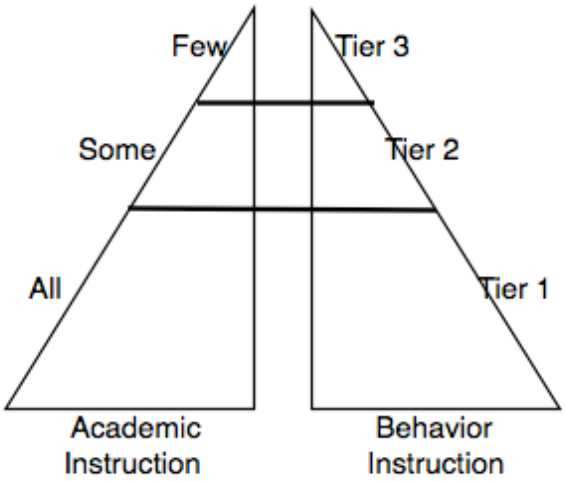
RTI addresses the individualized academic and behavioral needs of students: the framework for the instruction and identification of students with specific learning disabilities (SLD). However, MTSS reflects the larger, schoolwide implementation with all students and addresses academic and/or behavioral curricular instruction. It operates on three basic principles: a) effective teacher instruction is the most powerful predictor of student success, b) all students can learn, and c) schools must provide all students an education from which they benefit, which begins with preventing failure. Therefore, in schools implementing MTSS/RTI, decisions made by teachers about student instruction should be data driven and responsive to student need.

MTSS is characterized by its multi-tiered model providing increasing levels of support for students identified as needing these through universal screening or other school benchmarks. The model outlines varying levels of support for students. The supports can vary in duration, frequency, group size, and intensity. Duration refers to the length of time the student receives the intervention or support, such as the length of sessions or the number of weeks. Frequency refers to the number of times a day, a week, a month, etc; group size varies by level of support and content. Intensity encompasses duration, frequency, and group size. The more intense the student's need, the more frequently and longer the support will need to be provided and the smaller the group identified. Researchers interested in MTSS in early reading have suggested that if high quality reading instruction and reading interventions are not provided, especially by an early age of eight or nine, at-risk readers will continue to struggle into later grades and will

routinely be indentified for special education programs (Juel, 1998; Lyon, 2005; Moats, 1999; Torgesen, 2007). RTI has been defined as an alternative method to the IQ discrepancy method for identification of SLD (Fuchs & Fuchs, 2007; Justice, 2006). For example in reading, a second grade student who has not yet demonstrated mastery of phonemic awareness skills typically achieved by the beginning of first grade will benefit from continued small group, intensive instruction and intervention in these skills, as well as other grade level skills of phonics, vocabulary, and comprehension several days a week for an extended duration until proficiency is developed. If the student shows inadequate response to the intervention, then assessment results and intervention attempts can be considered in the identification process for special education supports.

Three tiers, or levels, of support are the most prevalent in the literature and implementation (Fuchs, Fuchs, & Compton, 2012; O'Conner, Harty, &Fulmer, 2005; Sailor, 2009b; Vaughn & Linan-Thompson, 2006). These three levels address at level 1, the universal supports provided for all students, level 2, targeted supports for some students, and level 3, intensive support for a few students. Figure 1 provides a common visual representation of this model when applied to both academics and behavior. High quality instruction is an important focus at each tier. Instruction and supports are the foundation of MTSS/RTI. Additional key factors include adherence to a conceptual framework, a focus on high quality research-based instruction, and implementation of universal screening, universal supports for all students, secondary supports for some students, tertiary, intensive supports for a few students, and data-based decision making (Lembke, McMaster, & Stecker, 2010). The sections that follow will address each of these critical elements as they apply to MTSS/RTI.

Figure 1. Response to intervention, three-tiered instructional model for academics and behavior.



Conceptual framework. While most conceptual frameworks of academic and behavioral MTSS/RTI models reported to date have three tiers of support for students, the common feature across all models is school implementation of the multi-tiered approach to provide differing levels of support for students according to their needs (Fuchs & Fuchs, 2007; Kratchowil, Clements, & Kalymon, 2011). The support at each tier, or level, is intensified to match the identified need. As soon as a student has demonstrated that he or she can benefit from a lower tier of instruction, the higher, more intensive supports, should be withdrawn. The tiers exist to provide a framework for appropriately supporting students so that all can benefit from the instruction they receive; tiers ought not be barriers to accessing support.

Early conceptualization of RTI focused on decision-making and did not encourage a specific system or method (Christ, Burns, & Ysseldyke, 2005). However, over time, a variety of

procedural approaches took shape. A predominant MTSS/RTI approach, and the one favored in this study, relies on a framework focusing on prevention of the development of learning disabilities in reading (Greenwood, Kratchowill, & Clements, 2008). By intervening early, MTSS/RTI aims to better support foundational reading instruction. RTI continues to also be conceptualized to address instructional needs and to offer an alternative to the IQ-discrepancy model for identifying students with specific learning disabilities (Hale, et al., 2010; Smith, Peters, Sanders, & Witz, 2010). Schoolwide MTSS varies from school to school, and district to district, based on issues of contextual fit with established school needs and goals (Biglan, 2004; Snell, 2008; Sugai, O'Keefe, & Fallon, 2011), trained personnel (Vaughn, et al., 2008), leadership (Hall, 2008), and other instructional resources and needs (Fuchs & Deshler, 2007; Gersten, Compton, Connor, Dimino, Santoro, Linan-Thompson, & Tilly, 2008; Justice, 2006; Klingner & Edwards, 2006; McIntosh, Filter, Bennett, Ryan, & Sugai, 2010; Newman-Gonchar, Clarke, & Gersten, 2009). Additionally, MTSS/RTI literature provides guidance and discussion on two approaches to implementation: a standard-treatment protocol approach (Fuchs & Fuchs, 2004) and a problem-solving approach (Sailor, 2009b). Schools typically shape their MTSS/RTI framework based on one or both of these approaches.

Standard Treatment Protocol RTI. A standard-protocol approach to RTI requires use of the same empirically validated treatment for all children (Fuchs, & Fuchs, 2007), which means that essentially, all children with similar learning difficulties are provided the same, validated treatment (ie, evidence-based), delivered with fidelity. With demonstrated effectiveness in research studies, this approach is focused on skill acquisition (Fuchs & Fuchs, 2007; Fuchs, Fuchs, & Compton, 2012). As the name suggests, schools following the standard-treatment protocol model follow a single standardized research-based protocol as a means to provide

instructional interventions for a set of students with similar identified needs. The idea is that the standard protocol ensures fidelity of treatment to the intervention design (Mellard & Johnson, 2007). This approach is widely used in *research* on RTI. For example, a standard treatment protocol of instruction using Peer-assisted Learning Strategies in first and second grade studies has been studied to assist in defining responsiveness to instruction for SLD identification (Fuchs, Fuchs, & Compton, 2004).

Problem Solving RTI. A problem-solving approach differs from the standard treatment protocol in its level of individualization and the depth of analysis prior to selection of the intervention (Fuchs & Fuchs, 2006). The problem-solving approach focuses on developing an education plan individualized for students with identified needs. This model assumes individualization based on need, with no single intervention expected to work for all students in a classroom (Batsche, Curtis, Dorman, Castillo, & Porter 2008; Sailor, 2009b). However, the approach requires a considerable amount of knowledge and expertise to exist among school staff in the areas of assessment and intervention (Fuchs & Fuchs, 2007, Sailor, 2009a). It promises excellent results. For example, utilizing the problem-solving approach with assessments has been found effective (VanDerHeyden, et al., 2007). The problem-solving approach is the most commonly found approach in *practice*, as opposed to prevalence in research of the standard treatment protocol, evidenced by instructional decisions informed by student data (Hall, 2008; Mohammed, Roberts, Murray, & Vaughn, 2009; Sailor, 2009b), improving school level systems (Sailor, 2009b), addressing program and instructional resource needs (Esparza-Brown & Dolittle, 2008; Klingner & Edwards, 2006), and planning professional development (Stuart & Rinaldi, 2009; Vaughn, et al., 2008).

High quality, research-based instruction. The quality of instruction has been found

influential on student academic outcomes (Darling-Hammond, 2000; Foorman, Francis, Fletcher, Schatschneider, Mehta, 1998; Haager, Klingner, & Vaughn, 2007; O'Connor, Fulmer, Harty, & Bell, 2005). An examination of what effective teachers do to improve student learning outcomes reveals common features of effective instruction: explicit instruction (Adams & Engelmann, 1996; Hattie, 2009; Klingner & Edwards, 2006), systematic instruction (Vaughn & Linan-Thompson, 2006), multiple opportunities for students to respond and practice (Archer & Hughes, 2010), immediate, corrective feedback to students (Shute, 2008), ongoing progress monitoring (Hattie, 2009; Shinn, 1998), and varied, flexible grouping (Vaughn & Linan-Thompson, 2004). These features, provided in layers of reading intervention in early grades, improve student outcomes (O'Connor, Fulmer, Harty, & Bell, 2005). When implementing MTSS/RTI professional development focuses on instructional features discussed above, as well as the academic or behavior content and skills, to build teacher capacity and improve instruction (Vaughn, et al., 2008; Knight & Michel, 2011).

Mandated in 2001 in the Elementary and Secondary Education Act (ESEA), the adoption of scientifically research-based reading programs became a foremost concern. *Research-based instruction* refers to instruction informed by the results of scientific studies providing evidence for the use and practice of specific strategies and programs for instruction, also referred to as *evidence-based*. MTSS/RTI have thus been defined as evidence-based practices (Justice, 2006). Guidance documents on selecting evidence-based practices have been federally funded. For example, much is known about how children learn to read (Adams, 1990; Moats, 1999) and reading research has identified five evidence-based essential components of high-quality reading instruction: phonemic awareness, phonics, comprehension, vocabulary, and fluency (National Reading Panel, 2000).

Universal screening. Schools implementing supports in an MTSS/RTI framework need to employ universal screening measures to assist in the identification of students possibly at risk for future academic failure, or delayed or inadequate social, emotional, and behavioral development. Universal screening means screening all students, and some research suggests the administration of additional assessments to further identify instructional needs (Fuchs, Fuchs, and Compton, 2012). The purpose of administering screening assessments at the beginning and middle of the school year is to understand the academic and behavioral needs of students with the goal that administrators and school teams will then use the data to plan universal, targeted, and intensive interventions and supports for students. Further, the results can become helpful to schools attempting to predict students who might be at risk in later grades (O'Conner & Jenkins, 1999). More prevalent in early grades, ideal screening measures take little time to administer and are easily understood by those administering them. It is imperative that a screening tool be valid and reliable for use with a given population (Gersten & Dimino, 2006). For example, screening tools for reading focus on important reading skills identified in the *National Reading Panel Report,* such as fluency (Hasbrouck & Tindall, 2006). Once a screening assessment has been administered universally the data should be reviewed to determine students who may be at risk and need additional testing, discussion, or observation to determine if targeted instruction for an academic area or targeted supports for behavior are needed. A number of screening approaches intend to detect reading risk in early grades (Jenkins, Hudson, & Johnson, 2007) The results of these approaches at different grade levels vary widely, from 8%-52% being identified as possibly at risk in kindergarten through fourth grades, possibly a result of the variety of instructional approaches, programs, and/or frameworks being used (Lembke, McMaster, & Stecker, 2010).

Progress Monitoring. Progress monitoring is an evidence based assessment practice and

important feature of effective instruction (Deno, Reschly, Lembke, Magnusson, Callender, Windram, & Satchel, 2009; Hattie, 2009). Progress monitoring data is an essential piece of providing focused supports throughout the year in MTSS/RTI implementation (Vaughn & Linan-Thompson, 2004). Progress monitoring data is collected periodically, e.g. every six weeks, as part of universal level supports, and more often in secondary and tertiary levels of support. In the more intensive levels, the data is used to determine the effectiveness of instruction and to guide a change in instruction if it is not demonstrating effectiveness (Lembke, McMaster, & Stecker, 2010). Ideally, a school-based team should work together to determine progress and advise on instruction and other needed supports (Sailor, 2009b). A key piece of MTSS/RTI framework (Batsche, et al., 2005), used in most state initiatives includes training in progress monitoring assessments (Hoover, Baca, Love, & Saenz, 2008).

Primary, universal supports. Universal supports, also referred to as Tier 1 instruction, are the initial focus of MTSS/RTI implementation. Universal supports are provided in general education and are provided to all students (Speece, Case, & Molloy, 2003). This level of support is characterized by its focus on high quality initial instruction, grounded in research, provided to all students. Providing evidence-based instruction and supports for an academic content area or for the social, emotional, or behavioral development in all students has been supported as a way to prevent future deficits (Doabler, Cary, Jungjohann, Clarke, Fien, Baker, Smolkowski, & Chard, 2012; Greenwood, Horner, & Kratochwill, 2008). A strong implementation of universal level support is the first step in reducing the number of students who will require more targeted and/or intensive supports (Nelson, Hurley, Synhorst, & Epstein, 2008; Torgesen, Alexander, Wagner, Rashotte, Voeller, & Conway, 2001).

Secondary, targeted supports. Targeted supports, also referred to as Tier 2 instruction,

are the secondary focus of MTSS/RTI implementation. Targeted supports are instruction and services provided for only some students. Students supported by Tier 2 instruction are generally identified by the administration of a universal screening or other school benchmark. In academics, the content of the targeted support will match the identified deficit measured with the screener or other assessment and is provided effectively in small groups (Foorman & Torgesen, 2001). For behavior, targeted support is also applied based on student need (Sugai, et al., 2000). If a student is in need of support with social skills, then social skills support is provided. Targeted support for academic and behavioral needs aims to prevent deficits and to remediate skills and strategies early. Once a goal is reached for a student receiving targeted support the targeted support is phased out and removed (Sailor, 2009b) and the student then returns to receiving only the universal supports (Lembke, McMaster, & Stecker, 2010; Vaughn & Fuchs, 2003).

Tertiary, and more intensive supports. The most intensive supports, Tier 3, are provided to those students who do not respond to the targeted support provided in Tier 2 in addition to Tier 1, universal supports (Harn, Linan-Thompson, & Roberts, 2008). What becomes important when meeting students instructional needs is providing the level of instruction needed, not a strict adherence to an inflexible framework (Lemons, et al, 2010). For example, depending on a school's needs, context, and interpretation of the RTI logic model, a school has the prerogative to bypass targeted, Tier 2 instruction and provide Tier 3 intensive interventions immediately after screening for a student, or students, depending on need. As suggested by its name, tertiary supports provide the most intensive level of supports in a three-tiered model. It is possible for a more intensive tier of intervention to exist in multi-tiered models with more than three levels. As with universal and targeted levels of instruction and intervention, the goal of

tertiary level intervention remains early prevention and remediation (Greenwood, Horner, Kratchowill, 2008). The least amount of research on MTSS/RTI implementation exists on this level of supports (Fuchs, & Deshler, 2007).

Data-based decision making. Data-based decision making is important in MTSS/RTI because it provides guidance for instruction and is driven by the progress, or lack thereof, of students. Data-based decision making can occur at the schoolwide, universal level down to the intensive, individual level. The data used for decision making in MTSS/RTI can differ greatly by school and are informed by needs and contextual fit (Biglan, 2004). As previously discussed, screening measures are often used to make schoolwide decisions early in the year and mid-year. The data-based decisions might include student selection, system support issues, resource allocation, or professional development planning (Stuart & Rinaldi, 2009). Additionally, Baker and Smith (2001) provide positive examples of two school's use of data to shape instructional and professional development activities improving reading outcomes. Data-based decision making at the individual or small group level uses additional assessments. For example, monitoring the progress of students, as previously discussed, through the use of curriculum-based measures (CBM) is one way to understand if students are responding to instruction or intervention (Shinn, 1998).

History of MTSS/RTI

MTSS (all student, schoolwide), RTI (special education prevention and identification), and positive behavior interventions and supports (PBIS-behavioral MTSS) hold much promise as frameworks for improving student academic and behavioral outcomes. The term *multi-tiered system of supports* has been described as a comprehensive system of differentiated supports that includes evidence-based instruction, universal screening, progress monitoring, formative

assessment, research-based interventions matched to student needs, and educational decision making using student outcome data (Chard, Harn, Horner, Simmons, & Kame-enui, 2008). MTSS is the schoolwide application of frameworks like RTI, for identification of learning disabilities, or PBIS, for prevention of behavior disorders. However, little is known about the effects of implementation of MTSS in a large, urban district serving a student population with lower racial and economic status (Massey, 2007).

Adopted from the multi-tiered prevention logic used in the community health and medical fields (Noam & Hermann, 2002; Pearce, 1996), early multi-tiered models were first applied in educational settings through special education, specifically early reading, through targeted interventions based on identified needs measuring the students' response to the intervention. Studies in this area have concluded that when young students identified with specific learning disabilities (SLD) related to reading, such as phonics and phonological awareness, were provided targeted interventions, most students benefitted from the additional instruction (Fuchs & Fuchs, 2006; Vaughn & Fuchs, 2003). Students' ability to respond to interventions, and therefore prevent future reading difficulties, has been an impetus for applying the RTI frameworks to additional content and skill areas. The prevention model from the medical field and demonstrated positive outcomes for students are the inspiration for wider support of RTI and similar frameworks. When the RTI logic model is applied schoolwide present custom is to use MTSS as the descriptor. This allows the RTI descriptor to be retained with its evidence-base in special education. With continuing evidence that students are failing to achieve in school at an alarming rate (Shores & Chester, 2009), the recent trend toward broad implementation of a MTSS/RTI, which holds promise for reversing this trend, is not surprising. MTSS/RTI implementation thus allows schools and districts to problem solve and to promote and sustain the

academic, social-emotional, and behavioral achievement of all students.

A multi-tiered approach is an essential component of MTSS/RTI implementation (Hall, 2008; Sailor, 2009b; Shores & Chester, 2009). The majority of the empirical evidence supporting RTI implementation and instruction published since 1997, when first implicated in special education law, has focused on early reading (Fuchs & Deshler, 2007). In recent years MTSS and RTI frameworks are being applied to other content areas and grade levels and implemented in a MTSS (Bryant, Bryant, Gersten, Scammacca, Funk, & Winter, 2008; Clarke & Shinn, 2004). As previously mentioned, MTSS/RTI frameworks share similarities and systems in the implementation of PBIS (Sailor, 2009b; Sugai, et al., 2000). The emphasis remains on the prevention of academic or social problems as supported in the Individuals with Disabilities Education Act (IDEA).

Foundation in IDEA. This literature review has thus far established that schools and districts across the nation implement MTSS/RTI to provide support for all students to address academics and/or behavior. Compliance with the laws and regulations that govern education is a primary concern for most school districts when developing and implementing MTSS/RTI--and rightly so. Understanding the roots of RTI in special education law provides a foundation for schools venturing to garner support from educators and administrators to create and implement MTSS to meet all student academic and behavioral needs (Yell & Walker, 2010). What follows is a brief discussion of the legislation and regulations that support the use of MTSS and RTI frameworks in kindergarten through twelfth grade education.

Support for the RTI framework is first found in the 1997 reauthorization of the Education of the Handicapped Act (P.L. 94-142), which was later renamed the Individuals with Disabilities Education Act (IDEA)(Batsche, et al., 2005). While the RTI framework was not explicitly stated

in the law in 1997, the provisions allowed for practices that resembled essential components of RTI—such as the use of classroom-based assessments and observations—for the purpose of determining categorical eligibility and developing students' individualized education plans (IEPs). Again in 2002, the President's Commission on Excellence in Special Education alluded to support of RTI (President's Commission on Excellence in Special Education, 2002). Clear evidence in support of RTI finally appears first in the "Findings and Purposes" section of the most recent reauthorization of the law in 2004. Later named the Individuals with Disabilities Education and Improvement Act (IDEIA), the section states that school districts are responsible for:

> supporting high-quality intensive pre-service preparation and professional development for all personnel who work with children with disabilities in order to ensure that such personnel have skills and knowledge necessary to improve the academic achievement and functional performance of children with disabilities including the use of scientifically based instructional practices, to the maximum extent possible. (20 U.S.C. 1400(c)(5)(E)

and

> providing incentives for whole-school approaches, scientifically based early reading programs, positive behavioral interventions and supports, and early intervening services to reduce the need to label children in order to assess the learning and behavioral needs of such children. (20 U.S.C. 1400 (c)(5)(F))

This section of the law focuses on scientifically based instructional practices, behavioral interventions and supports, and early intervening services, each of which has recently been identified as a critical element of schoolwide MTSS/RTI (Hall, 2008; Sailor, 2009b). Given this, the connection from the law to the technical aspects of the RTI framework is easy to see. This law further supports implementation of an RTI framework as an alternative to the IQ discrepancy model for special education identification when it states:

> In determining whether a child has a specific learning disability, a local education agency may use a process that determines if the child responds to scientific research-based intervention as part of the evaluation procedures described in paragraphs (2) and (3). (20 U.S.C. 1414(b)(6)(B))

Further, the regulations contain more explicit guidance for schools and districts when identifying specific learning disabilities, demanding that:

> [a] State must adopt, consistent with Sec. 300.309, criteria for determining whether a child has a specific learning disability as defined in Sec. 300.8(c)(10). In addition, the criteria adopted by the State-
>
> a. Must not require the use of a severe discrepancy between intellectual ability and achievement for determining whether a child has a specific learning disability, as defined in Sec. 300.8(c)(10);
> b. Must permit the use of a process based on the child's response to scientific, research-based intervention; and
> c. May permit the use of other alternative research-based procedures for determining whether a child has a specific learning disability, as defined in Sec. 300.8(c)(10).

and that

> [b]Consistency with State criteria. A public agency must use the State criteria adopted pursuant to paragraph (a) of this section in determining whether a child has a specific learning disability.

The term *multi-tiered systems of support* appeared first in proposed education legislation recently as part of drafts and mark ups of the Amendment of the Elementary and Secondary Education Act (Amendment of the Elementary and Secondary Education Act of 1965, 2011).

MTSS and School Improvement

Many students continue to enter school at a disadvantage, with language and literacy skills below grade level peers (Mathes & Torgesen, 2000). Research suggests these disparities can be related to educational investments in terms of quality dialogue, vocabulary and cognitive development made by parents in relation to socioeconomic status (Hart & Risley, 1995; Lareau, 2003). In recent history these students, often limited in English proficiency or who come from poor families, were allowed to fail and were then given labels such as a "student with a learning disability", an "emotional or behavioral disorder", or "attention deficit disorder" (Gregory, Skiba, & Noguera, 2010; Ortiz, 1997; Wilkinson, Ortiz, Robertson, & Kushner, 2006). This is unfortunate, as they are children who typically could learn to read at expected levels when

provided appropriate instruction (Mathes & Torgesen, 2000). More often than not, these children have just not been provided adequate instruction. MTSS and RTI seek to ensure quality instruction and intervention for all students (Sailor, 2009b). Mathes and Torgesen (2000) suggest children experiencing reading difficulties represent as much as 40% of a school's population. Ignoring such a large number of students "serves only to promote an underclass trapped in a cycle of illiteracy, prevented from expressing their true potential" (Mathes & Torgesen, 2000). One of the benefits of MTSS and RTI, though, is that they seek to improve and ensure quality instruction and intervention for all students, not just those who enter school underprepared (Hall, 2006, Sailor, 2009b) which may increase the potential for parental and community buy-in.

MTSS/RTI has the opportunity to help provide all students, from all backgrounds, equal educational opportunity regardless of the academic or behavioral difficulties they face--especially as issues of disproportionality exist in learning disability identification (Harry & Klingner, 2006; McCall & Skrtic, 2009). MTSS, the schoolwide implementation and adoption of a framework for providing academic and behavior interventions, supports the use of a problem-solving model that focuses on student needs in all areas, connecting the efforts of many school personnel and resources. MTSS/RTI can thus be seen as an organizational innovation aimed at improving instruction and reducing identification and disproportionality. MTSS/RTI may be a vehicle for change by providing a framework for the organizing of more equitable programs with partnerships among schools, families and the community (Epstein, 2005). For such an initiative as this to be successful, it must be designed and implemented as a result of coordination and collaboration both inside and outside the organization (Elmore, 1996). Additionally, examining the change in school structure necessary to support this effort is vital to organization hoping to adapt and create an effective system of supports for students in the

MTSS/RTI implementation. The current institutional structure of many schools will need to change and respond to the challenges in MTSS/RTI, not just adapt to the framework as reform (Elmore, 2000). Therefore, MTSS/RTI research and implementation thrives in an environment where teachers are encouraged to collaborate with each other, the community, and parents, making decisions, providing guidance, and taking more responsibility for all students' academic and social welfare.

Schoolwide Applications Model. One example of MTSS/RTI focused on improving supports is the Schoolwide Applications Model (SAM). SAM is a data-based approach to structural school reform using MTSS with embedded RTI. It is intended to replace categorical fragmentation of educational resources and supports within schools with fully integrated and coordinated resources focused on improving academic and social outcomes for all students (Sailor, 2009b). SAM is a general education support approach to focus and direct all school, family and available community-based resources on measurable academic and social improvement. SAM provides multiple tiers of instruction and intervention, is focused on student academic and behavioral needs as identified through screening, and uses continual progress monitoring to gauge whether or not the system is working for individual students. SAM is directed by six guiding principles: a) all instruction is guided by general education, b) all school resources are configured to benefit all students, c) school proactively addresses social development and citizenship, d) school is a data-based learning organization, e) school has open boundaries in relation to its families and its community, and f) school enjoys district support for undertaking the extensive systems-change activities required to implement.

The Schoolwide Applications Model incorporates and utilizes the guiding principles and 15 critical features in an assessment tool, the SAM Analysis of Selected Critical Features

(SAMAN-Sailor & Roger, 2003). Using this tool, schools are evaluated on how effectively they are implementing the fifteen critical features of SAM. Trained SAMAN assessors evaluate schools approximately every six months for a minimum of three years. These evaluations include multiple observations of classrooms and other school settings. Evaluators conduct interviews with the principal, general education teachers, special education teachers, support staff, paraprofessionals and the PBIS chairperson. Also, school documents are reviewed for evidence of progress. The review includes schedules, office referral forms, the PBIS action plan, school improvement plan, and student discipline handbook. SAMAN is an essential tool for school leadership teams (SLTs) to track progress toward full SAM implementation, identify goals for further improvements and show results of SAM implementation (Sailor & Roger, 2005). Results from the SAMAN have been shown to predict changes in statewide tests of academic performance in the areas of English language arts and mathematics (Haynes, Joannou, Mitchiner, Palmer, Sweeney, 2011). SAM is implemented in a number of states and the schools that have adopted the SAM model are realizing myriad benefits. Within SAM schools students appear to be receiving improved supports and realizing increased academic and behavioral outcomes (McCart, 2003; Sailor & Roger, 2005; Sailor, 2009b; Sailor, Zuna, Choi, Thomas, McCart, & Roger, 2006).

Improving systems. Today we also benefit from an abundance of research on how academic and behavioral disparities and difficulties can be more effectively remediated. Considering the focus of MTSS/RTI is prevention (Chard, et al., 2008), reflecting on system issues provides focus to improve schools and instruction and therefore student success (Sailor, 2009a). As previously stated, MTSS/RTI aims to support teachers, schools, and districts with guidance and research to address both academic and behavioral systems within the school to

improve student success. Further, the idea of a level academic playing field for all students is one that does not take issue with the structures and structural issues preventing participation. Community schools, one early example of a system change initiative focused on supporting all student needs, offer an example for improving systems and pairing support agencies and services within schools (Lawson & Sailor, Sailor, 2009a, Sailor, 2009b). If schools truly seek to level the playing field for all students then educational institutions do best to seek to include and support all students and their families (Kashima, Schleich, & Spradlin, 2009). Community schools offer insight for schools implementing MTSS/RTI on how to incorporate the needs of students and families to foster equality in attaining educational success, but these schools are limited in number (Blank, Berg, & Melaville, 2006). Despite cynicism that schools can only 'so much' to further goals of equity and equality in a society, schools disregard current positive research understandings on improvement and innovation and fail to make the connection to their notably unequal circumstances (Darling-Hammond, 2010; Hart & Risley, 1995; McLaughlin & Thurlow, 2003), much can be done including the incorporation of lessons learned from community schools in MTSS/RTI. MTSS/RTI frameworks incorporating these supports benefit from following this social work and sociological perspective to address the variety of problems confronting students and their families who are in need of resources (Lawson & Sailor, 2000; Sailor, 2009a). Systems should also address the shared responsibility of educators and families for children's learning and success in school (Epstein, 2005). Problem-solving and/or leadership teams must be convened to assist in planning and to reflect on current practices and systems for improvement (Elmore, 2004; Shores & Chester, 2009).

Improving supports. Roles for general and special education teachers providing supports in MTSS implementation are changing (NEA, 2006). However, teacher, administrator,

school and district attitudes toward the changing roles will take time, but the rules governing these newer practices are firmly in place. Focus is needed on school leadership and the people within the system and the context in which the system operates. Leadership must support pedagogical adoptions and organizational innovations like MTSS and RTI, providing more focused professional development and sound decision-making processes (Fullan, 2007; Vaughn, et al., 2008). As previously mentioned, reading and behavioral systems are seeking to improve supports to students using MTSS/RTI. Additionally, much is known about supporting and improving behavior using positive behavioral interventions and supports (Sugai, et al., 2000). The promise of MTSS/RTI success is most likely attributed to the supports provided. For example, early studies of MTSS/RTI frameworks integrating academic and behavioral supports for students suggest improved academic and behavioral outcomes over models addressing only academic or behavior needs (Horner, Sugai, & Anderson, 2010; Volpe, Young, Piana, & Zaslofsky, 2012). These studies reflect the improvement of supports.

Including families in MTSS. The implementation of an MTSS/RTI framework offers a unique opportunity for schools and parents to partner in student learning. Such frameworks should not be considered complete if they do not explicitly address collaboration with families (Kashima, Schleich, & Spradlin, 2009). A comprehensive, MTSS/RTI framework will support the strengthening of families and address the needs of those families and their school-aged children in achieving lasting positive academic and social outcomes (Sailor, 2009b).

Cultivating family-school relationships early regarding MTSS/RTI provides a foundation for continued family-school partnerships (McCart, Lee, Frey, Wolf, Choi, & Haynes, 2010). Research shows that parents' participation in their children's education increases student outcomes (Olsen & Fuller, 2003) and predicts positive teacher-child relationships (Dearing,

Kreider, & Weiss, 2008). Consequently, parent participation and family support is both education and disability policy (Turnbull, Stowe, & Heurta, 2007). Implementing MTSS/RTI could change and improve the traditional roles placed on parents in an educational relationship (Cortiella, 2005; NRCLD, 2004), further increasing student supports and thereby success. For example, one way the roles can be improved by viewing parents and families are seen as stakeholders in the process and not just recipients (McCart, et al., 2010). The implementation of a RTI framework offers a unique opportunity for schools and parents to partner in student learning. Delgado-Gaitin (1991) provided evidence of empowering parents through involvement at school. Further, in implementing MTSS/RTI, successful parent engagement has been noted in a number of examples and case studies (Dearing, et al., 2008). Parents and their voices must be valued and honored because MTSS/RTI is being used for identification of students with learning disabilities (RTI), and unfortunately, court cases already offer many examples of where parent rights were violated (Walker & Daves, 2010).

A focus on reading instruction. More than a decade ago, the National Reading Panel (NRP) published a report outlining pivotal findings regarding the effective teaching of reading and prevention of reading difficulties. This report, *Report of the national reading panel: Teaching children to read* (NRP, 2000), provided a synthesis of the scientific research literature and detailed five essential components of effective reading instruction. The five essential components include phonemic awareness, phonics, fluency, vocabulary, and comprehension. Teachers perceive they are inadequately prepared to provide reading instruction and specific interventions for students who struggle with reading (Boe, Shin, & Cook, 2007). Moats (2009) suggested policy mandates for improving reading instruction should provide for more effective teacher education. However, for the many schools implementing MTSS/RTI for reading,

professional development needs for current teachers becomes a focus and critical need. The pedagogy and knowledge to provide instruction in reading skills and strategies, a task more difficult than most realize (Adams, 1990; Moats, 2009), is an important part of most MTSS/RTI implementation. Fortunately, this professional development can culled from the reading research-base, built on reading and language related intervention research for students with, or at risk for developing, learning disabilities (Hart & Risley, 1995; Hattie, 2009). Direct, explicit instruction is particularly important for students who struggle (Bryant, Goodwin, Bryant, Higgins, 2003; Hattie, 2009; Vaughn & Linan-Thompson, 2004). Teachers must also have knowledge to ameliorate language differences (Biemiller & Boote, 2006). Additionally, research shows learning disabilities (Torgesen, 2000) and racial/ethnic differences (Hart & Risley, 1995) create early-grade differences. These, and other research-based reading related findings, provide the foundation (Stanovich, 2000) for evidence-based instructional approaches schools implementing MTSS/RTI select and rely on to improve their student's outcomes.

Integrating academic and behavioral supports. While schools are tasked with providing both academic and behaviorally focused interventions to students identified as possibly at risk for future underachievement in academics or deficient social, emotional, and behavior development (Chard, et al., 2008; Greenwood, Horner, & Kratchowill, 2008), they often begin implementing MTSS/RTI to address either academic or behavioral instruction. However, when schools are considering the application of a multi-tiered system of supports for academics or behavior they could also consider a combined, or even integrated, approach. In addressing both, schools hedge their bets and can work for the best overall student outcomes. Research has suggested that when academic and behavioral systems and instruction are implemented together the results will be better academic and behavioral outcomes than if only

academics or behavior were addressed (Horner, Sugai, & Anderson, 2010; Volpe, et al, 2012).

Conclusion

MTSS/RTI frameworks incorporate several critical features. Implementation, at a minimum, focuses on: a) high quality, effective instruction, b) universal screening for all students, c) a multi-tiered model for intervention and instruction, d) research-based, or evidence-based, instruction, and e) the use of data for decision making (NASDSE, 2001). Identifying schools implementing a multi-tiered system of supports with embedded RTI is easy when these critical features are present. The problem-solving approach supported by the RTI logic model advocates for school teams and systems to guide the supports and resources and monitor the data to determine whether the instruction and intervention being provided students is effective. Though the roots of RTI are in special education law, with similarities to general education law, the promise of MTSS/RTI has led to a growing population of adopting schools (Sailor, 2009b). Laws mandating RTI logic, when posed as positive rights in terms of making a free appropriate education available to all children, are beginning to better shape our schools with parents and the community as partners. If our national policies and rhetoric support and promote the implementation of MTSS/RTI, then school and system behaviors will most likely aim to align with those policies. Thus, this study seeks to investigate the impact of one district's MTSS/RTI implementation on reading outcomes.

While implementation is occurring in many districts, the effects in urban districts implementing MTSS/RTI hold promise for illustrating and describing trends of implementation impact for groups of economically and demographically diverse students, including students with disabilities. The National Center for Educational Statistics (2011) has formally begun analyzing and monitoring reading outcomes and progress for urban schools in comparison to the nation and

other large districts for fourth and eighth graders. One finding is that no urban districts showed improved scores in reading from 2009 to 2011 (NCES, 2011). Given such disheartening news, it is especially important now that we consider the impact of MTSS/RTI in urban educational contexts. With the promise of MTSS/RTI improving academic and behavioral outcomes, the effect of urban implementation efforts are of the utmost importance for policymakers, state leaders, district stakeholders, and schools focused on improving reading for all students in urban schools.

Study Questions

In order to build the research base necessary to consider MTSS/RTI effective in large, urban districts, this research study addresses two main questions:

1. Do reading scores on the Texas Assessment of Knowledge and Skills (TAKS) improve in schools implementing MTSS/RTI compared to similar schools not implementing MTSS/RTI?

2. What is the impact of MTSS/RTI on reading scores of students identified for special education in an urban district? What trends are observable in scores for students identified for special education versus trends for all students?

CHAPTER 2: Methods

The implementation of MTSS/RTI began to appear widely in the early part of the last decade, partially as a result of legislation and funding opportunities aimed to support and research the approach. The expressed purpose of Reading First, as detailed by the U.S. Department of Education (2002), included: (a) assistance to states and districts to establish scientifically based reading programs for students in kindergarten through grade three, (b) funds to support increased professional development, ensuring that all teachers have the skills they need to teach these programs effectively, and (c) funds to support the use of screening and diagnostic tools and classroom-based instructional reading assessments. Only state education agencies were awarded the funds, and Texas received its award of $79 million dollars on May 9, 2003 (U.S. Department of Education, 2003). To support the purpose of the federal program, The Texas Reading First Initiative (TRFI) further stipulated the use of a three-tiered reading model, the use of a local campus coach, adoption of a scientifically-based core reading program (Knight & Michel, 2010), further outlined in Table 1. Schools participating in TRFI also had to meet a number of additional criteria, including a high number of students receiving free or reduced lunch and identification as lower performing.

Purpose of the Study

The first purpose of this study was to determine the effect of MTSS/RTI implementation on reading achievement of all students. The second purpose of this study was to determine the effect of MTSS/RTI implementation on reading achievement for students identified for special education. Further, this study sought to understand the implementation of MTSS/RTI implementation in urban districts, as they provide educational supports for the largest numbers of culturally, linguistically, physically, and financially diverse students.

Table 1

Key Tenets of the Texas Reading First Initiative and the MTSS/RTI Implementation

Key Tenets of Texas Reading First Initiative
1. Focus and support for reading in grades K-3 general education
2. Focus and support for reading in grades K-12 special education
3. Implementation of a three-tiered reading model including 90 minutes of instruction daily in a scientifically-based core reading program
4. Use of a local campus reading coach
5. Selection and use of universal screening assessment of reading
6. Selection and use of progress monitoring assessment(s) of reading
7. Professional development for teachers and administrators in reading skills, reading strategies, reading programs, screening and progress monitoring assessments, classroom management, planning, small group instruction, intervention programs, and leadership.

Texas Education Agency (Undated). *Overview of Texas Reading First*.

Participants

The participants in this study are third grade students in sixty-two elementary schools in one large, urban district in the Southwest United States over a six-year period. They were selected to measure and compare the effects of implementing MTSS/RTI focused on reading instruction in kindergarten through third grade during 2002-2007, as part of the TRFI. Using archived third grade TAKS reading and demographic data made available to the researcher

through a proposal and approval process with the selected district, thirty-two elementary schools were identified as a treatment group, implementing MTSS/RTI. Additionally, thirty elementary schools were identified as a comparison group, not implementing MTSS/RTI as part of the TRFI.

Table 2

Study Participant Characteristics (N=28,885)

Characteristic	Treatment # (%)	Comparison # (%)
Total Number	16624	12231
Gender		
Male	8324 (50.1)	6065 (49.6)
Female	8280 (49.8)	6148 (50.3)
Missing	20 (0.1)	18 (0.1)
Ethnicity		
Indian or Alaskan Native	29 (0.2)	32 (0.3)
Asian or Pacific Islander	215 (1.3)	225 (1.8)
Black	4423 (26.6)	3074 (25.1)
Hispanic	11080 (66.7)	6602 (54.0)
White, not Hispanic	857 (5.2)	2280 (18.6)
Missing	20 (0.1)	18 (0.1)
Economic Status		
Not Economically Disadvantaged	2247 (13.5)	3144 (25.7)
Eligible for Free Meals	13093 (78.8)	7971 (65.2)
Eligible for Reduced Meals	1264 (7.6)	1098 (9.0)
Missing	20 (0.1)	18 (0.1)
Special Education		
Not Classified Special Education	16169 (97.3)	11765 (96.2)
Classified Special Education	435 (2.6)	448 (3.7)
Missing	20 (0.1)	18 (0.1)

Descriptive statistics on the total sample are provided in Table 2. Further, Table 3 provides details on the number of students receiving special education in the sample each year

and separated by treatment and comparison groups.

Table 3

Students Receiving Special Education in Sample, By Year (N=883)

Students Receiving Special Education	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	Total
Treatment # (%)	**60** (13.8)	**63** (14.5)	**49** (11.3)	**58** (13.3)	**71** (16.3)	**134** (30.8)	435
Comparison # (%)	**57** (12.7)	**56** (12.5)	**72** (16.1)	**60** (13.4)	**68** (15.2)	**135** (30.1)	448
Year Total	117	119	121	118	139	269	883

In implementing this 3-tiered reading model, treatment schools were selected because of their participation in the initiative, which signaled their attempt to improve reading ability through implementation of the following five features: (a) the administration of a universal screening measure, (b) the provision of targeted reading interventions utilizing a multi-tiered system of supports, (c) the administration and collection of progress monitoring data throughout the year, (d) a plan for providing instruction through three increasingly intense tiers of support, and (e) funding and technical assistance to support these activities, including professional development and coaching reflecting the five essential components of reading (NRP, 2000) and classroom management.

Data

The independent variable in the study is the implementation of MTSS, defined as the 3-tiered reading model as part of TRFI. The dependent variable, reading ability and comprehension, is operationally defined as student scaled scores on the TAKS third grade reading assessment. This study utilizes scores from the TAKS and TAKS A (accommodated) for the first administration in each year. If students were absent during this particular administration

there scores on a later administration were not included in this study and analysis. The TAKS A contains the same content as TAKS, but has larger print and more white space. There are two other versions of the TAKS test given to students in special education, but these are alternative and modified assessments and the scores are not comparable to the TAKS and TAKS A. The comparative, interrupted time-series design allows for an examination of data both before and after the interruption including analysis of the trends in scale scores for both the treatment and comparison group for all students and further analysis of trends in reading scores for students in special education. These analyses require at least six years of data, since the models in ARIMA are determined unidentified when only five years of data exist.

Design

One useful method for evaluating the implementation of MTSS/RTI is an interrupted time-series design to analyze impact on student growth before, during, and after implementation (Bloom, 2003). MTSS/RTI utilizes a prevention focused logic model tailoring instruction to better match each student's need. By virtue of the tiered support structure and prevention logic, this approach is conceptualized as a schoolwide instructional model thus, the effects of implementing a multi-tiered system of supports are realized at the school level.

While this study was designed to provide additional evidence of the effects of implementing MTSS in large, urban districts, no single, uncomplicated research design exists to address the complex, multifaceted nature of implementing a schoolwide MTSS (Shapiro, 2009; Smith, et al., 2009). However, a quasi-experimental interrupted time-series design offers a method for generally evaluating large-scale implementation (Bloom, 2003). Further, the design allows comparison with a demographically and geographically similar comparison group of schools and students not participating in the implementation of the TRFI. Using the comparative,

interrupted time-series, the broad impact of the implementation can be interpreted with data from the 62 schools for all students, including identified for special education.

In recent years, this design (Bloom, 2003; Orwin, 1997: Shadish, Cook, & Campbell, 2002) has been similarly used to measure the impact of other large-scale education implementation initiatives such as inclusion of students with disabilities in general education classrooms (Johnson, 2007; Ralabate, 2008), response to intervention (Keresztes, 2011), and a violence prevention program (Oglesby, 2010). The present study conducted the comparative, interrupted time-series design to analyze third grade reading test scores wherein an implementation of MTSS/RTI for reading comprised the treatment. The "interruption" for this study is defined as between the 2003-2004 and 2004-2005 school year, the time when all treatment schools in the sample met the five earlier identified criteria on the Treatment Fidelity Scale (discussed below). While some of the schools had initially began the implementation in the previous year, overall fidelity was achieved during the interruption period. Specific personnel, coaches, were assigned to support implementation at each particular campus. State level technical assistance partners were additionally supporting the district and campuses, and an evidence-based reading curriculum was being used in a 3-tiered model. Table 4, illustrated below, details the schools years in the study and the treatment and comparison school year *interruption* of the implementation of the TRFI initiative.

Table 4

Interrupted time-series study design

2002-2003	Interruption	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
YR 1		YR 2	YR 3	YR 4	YR 5	YR 6

To verify the implementation of MTSS in the treatment schools and to confirm the absence of MTSS implementation in the comparison schools the Treatment Fidelity Scale (See Appendix A) was used. The fidelity scale addresses each school's participation in the TRFI. The scale includes a form to record information collected through document reviews and school, district, and/or state level contact regarding the presence of key tenets of TRFI as described in Table 1. An outside observer completed the scale through document reviews and/or contact with all treatment and comparison schools. The analysis reflects the confirmation of schools in both the treatment and comparison groups. This scale was adapted with permission from a similar scale (McCart, 2003).

Analysis

The database includes third grade scale scores from the first administration of TAKS for one year before implementation of MTSS/RTI and the five years following implementation. To complete the time-series analysis an auto-regressive, integrated, moving average (ARIMA) time-series model was used. Interrupted time-series analysis using the ARIMA model has been used to estimate effects for a variety of interventions studies (Johnson, 2007; Keresztes, 2011; Oglesby, 2010; Orwin, 1997; Ralabate, 2008). The analysis was run using Statistical Analysis Software (SAS). The database and interrupted time-series model was used to address research questions. There are three general steps to the analysis of the interrupted time series: (a) identification of patterns, (b) estimation of the size of the effect, and (c) a procedure to determine residual scores for unaccounted patterns (Tabachnick & Fiddel, 2005). The unit of analysis on the interrupted time-series design is the school. The mean of the mean reading scale scores for each campus is reflected each year in the results. The strength of this study is that it assesses large-scale implementation of MTSS/RTI and the school-level effects overall and for students

receiving special education. Other studies have concentrated on effects for individual students, small groups of students, and individual schools, thereby limiting the understanding of the impacts when implementing in large number of schools. This study aimed to reflect a deeper understanding of urban district outcomes.

CHAPTER 3: Results

Limited large-scale studies exist to examine the effect of MTSS/RTI implementation to improve academic outcomes for students in early grades. The central purpose of this study was to examine the effect of a large, urban district's implementation of a multi-tiered system of supports on student reading achievement over time. The study examined the implementation of a 3-tiered reading model, as part of the Texas Reading First Initiative (TRFI), and specifically the effect on the school level Texas Assessment of Knowledge and Skills (TAKS) reading scale scores for all third grade students, including a comparison with scores for students identified for special education. Data from the TAKS were collected for the comparative, interrupted time-series analysis from the selected large, urban district for the following school years:

1. Before implementation of a three-tiered reading model, 2002-2003
2. The year of model formation and beginning implementation, 2003-2004
3. Years during continued implementation, 2004-2005, 2005-2006, 2006-2007
4. The final year of implementation, 2007-2008.

As depicted previously in Table 4, the *interruption* in this study occurred between school years 2002-2003 and 2003-2004.

In this chapter, two types of results are provided. First, descriptive student, school, demographic, and assessment data are presented to identify the population in the study. Next, the results of the comparative, interrupted time-series are presented, as they addressed the study's research questions. Initial review of the literature on the implementation of MTSS/RTI for reading raised an expectation that improved test scores would result (Chard, et al., 2008) as well as a reduction in the identification of students with learning disabilities due to improved instruction (Torgesen, 2007; Wanzek & Vaughn, 2011).

Descriptive Information

TAKS mean scale scores for reading were collected for the school district's third grade students who attended 32 elementary schools implementing MTSS/RTI and 30 schools not implementing the model and not receiving funds through TRFI. The student scale scores and school demographic information for the students enrolled in the 62 schools selected were obtained from the district for the years identified above. The presentation of descriptive statistics that follows in Table 3 describes the study population, including information regarding: the number of third grade students, gender, ethnicity, economic status, and participation in special education. Descriptive statistics of the study population indicate similar percentages of students for most ethnicity groups. Some differences can be noted in Table 2. Most notable is the disparity between the percent of White (not Hispanic) students in the treatment (5.2%) versus the comparison group (18.6%). Though differing, the percent of Hispanic students in the treatment and comparison groups still represent at least half of the students in the groups overall. It is the opinion of the researcher that these groups are adequately similar in demographics. Geographically, these schools are all located in the same county. No other selection of school campuses for the comparison group would have provided a more demographically similar result.

Question One Results

The initial research question in this study asked: what impact does implementation of MTSS/RTI in reading have on student academic achievement as measured at 3rd grade on TAKS? To address this question, a comparative, interrupted time-series design was employed to examine the effect of implementation of MTSS/RTI. The effect of an interrupted time-series analysis of an intervention is assessed through interpretation of coefficients for the intervention indicator variable (Tabachnick & Fiddel, 2005). TAKS third grade test data were collected in the

spring of each school year beginning one year before the implementation and continuing five years following the implementation for both a treatment (n = 32) and comparison (n = 30) groups of schools. The model results provided in Table 5 and Table 6 reflect the models retained for interpretation for both the treatment and comparison groups. The models retained reflect the models with the lowest Akaike's Information Criterion (AIC). The AIC (46.63295) in Table 5 below indicated that this was the best fitting model for the treatment schools and the AIC (49.03026) in Table 6 below suggested it was the best fitting model for the comparison schools. NUM1 is the dummy coded variable representing the intervention parameter, the implementation of MTSS/RTI, analyzed to determine the effect of the intervention.

Table 5

The ARIMA Procedure for Overall Mean of Reading Scale Scores in Treatment Schools

The ARIMA Procedure

Conditional Least Squares Estimate

Parameter	Estimate	Approx Std Error	t-value	Pr > |t|	Lag
MU	2185.3	10.34538	211.23	< .0001	0
NUM1	56.15984	11.33279	4.96	0.0077	0

Constant Estimate	2185.252
Variance Estimate	107.0269
Std Error Estimate	10.34538
AIC	46.63295
SBC	46.21647
Number of Residuals	6

*AIC and SBC do not include log determinant

As seen in Figure 2, only one year of data existed before the intervention and thus normality of the sampling distribution cannot be determined. No autocorrelation plots are

provided because there is a lag of 0, indicating that no correlation of past values exists. The moving average parameter was 2185.3, which is statistically significant, with $t = 211.23$, $p < .05$. While important, this is only a test of significance indicating the average was not equal to zero. The intervention parameter (56.15984), was statistically significant, $t = 4.96$, $p. < .05$, suggesting that the impact of the implementation MTSS/RTI for reading resulted in a significant increase in reading mean scale scores at the school level. With an average reading mean scale score of approximately 2185 before implementation, the intervention and implementation of MTSS/RTI accounted for an approximately 50 point scale score improvement in overall school mean scale scores. Thus, this model was determined significant for the treatment group and trend analysis indicated implementation of MTSS/RTI to be effective in improving overall school reading mean scale scores.

Table 6

The ARIMA Procedure for Overall Mean of Reading Scale Scores in Comparison Schools

The ARIMA Procedure

Conditional Least Squares Estimate

Parameter	Estimate	Approx Std Error	t-value	Pr > |t|	Lag
MU	2209.1	20.14345	109.67	< .0001	0
AR1,1	1.00000	0.38193	2.62	0.0791	1
NUM1	53.71754	15.91499	3.38	0.0432	0

Constant Estimate	0.001708
Variance Estimate	152.4719
Std Error Estimate	12.34795
AIC	49.03026
SBC	48.40554
Number of Residuals	6

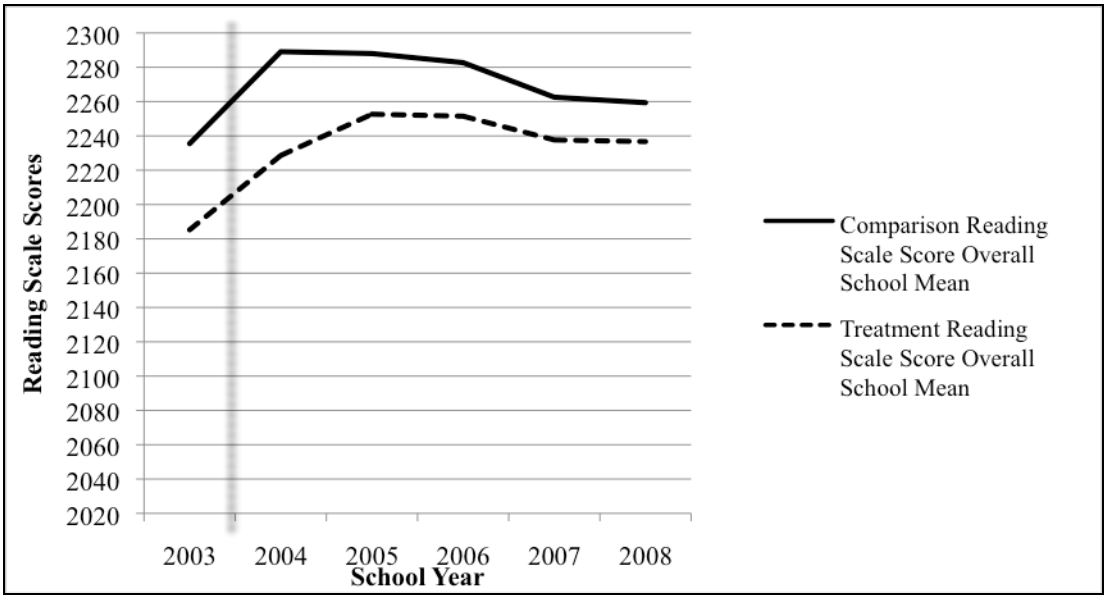
*AIC and SBC do not include log determinant

To further validate findings, the comparison group data, reflecting overall school level reading scale scores, were also analyzed using the interrupted time-series. Analyzing these trends and comparing them to trends in the treatment group results provides validation for the treatment group results when they differ from results in the comparison group. The findings of the interrupted time-series on comparison schools, also seen in Figure 2, have only one year of data existing before the intervention so normality of the sampling distribution cannot be determined. The autocorrelation results are provided ($t = 2.62$), indicating there is not a significant effect when scores are correlated with prior year scores. The ARIMA (1,1,0) moving average parameter was 2209.1, which is statistically significant, with $t = 109.67$, $p < .05$. The intervention parameter (53.71754), was statistically significant, $t = 3.38$, $p < .05$. The impact of not implementing an MTSS/RTI for reading, thus following the regular district curriculum, also resulted in an increase in overall reading mean scale scores at the school level. With an average reading mean scale score of approximately 2235 before implementation, a 24 point scale score improvement was observed in the overall comparison group school's mean scale score in the final year of the study, 2007-2008. Thus, the absence of MTSS/RTI implementation reflects a similar, but not identical, trend and therefore supplies validation to the improved reading scores found in the treatment schools.

Additional observable trends in the data indicate an abrupt increase in treatment school mean scale scores. The first year after implementation of MTSS/RTI in the district, mean school reading scale scores for the treatment and comparison group both rose over 40 points. Most schools in the treatment group evidenced a peak in mean scale scores in the second year of implementation while schools in the comparison group peaked in the year prior. The year prior to the interruption and the beginning, 2002-2003, was also the first year the TAKS test was

administered. This may explain the lower scores overall in 2002-2003. Thus, the interrupted time-series model was determined significant for both the treatment and comparison groups. While the comparison school mean scores remain above the treatment school mean scale

Figure 2. Interupted time-series analysis of school level reading mean scale scores for all students, including students receiving special education.



scores, scale score improvement in both groups is evident. Importantly, while the treatment and comparison schools in this study are geographically and demographically similar, higher mean school scale scores in the comparison group reflect the selection process for schools participating in TRFI. Recall that only schools identified already lower performing qualified to participate in TRFI. One additional finding reflected in Figure 2 was the continued growth of school level mean scale scores in the treatment group as comparison group scores begin to decline in 2004 and 2005. The findings of the interrupted, time-series for the treatment schools suggest implementation of the model over the first few years effectively improves TAKS reading scale

scores. Trend analysis does indicate a dip in outcomes after several years of implementation. Treatment schools showed a greater magnitude of change from start to finish than comparison schools. Further, trends indicating the greater improvement of overall school level reading scale scores in the treatment group also indicate a closing of the gap between scores in the treatment and comparison schools. These findings have many implications for further research and practice.

Question Two Results

The second research question in this study asks: what is the impact of implementing MTSS in reading for students identified for special education? To address this question, a comparative, interrupted time-series model for reading knowledge was also developed to examine the effect of implementation MTSS/RTI for students identified for special education. The same TAKS third grade test data used to analyze research question one in this study was employed for question two. Similarly, the model results provided in Table 7 and Table 8 reflect the models retained for interpretation for both the treatment and comparison groups, again using the AIC as the indicator of the best fitting model. The AIC (66.14926) in Table 7 below indicated this was the best fitting model for the treatment schools. The AIC (67.56465) in Table 8 below indicated this was the best fitting model for the comparison schools.

As seen in Figure 3, only one year of data existed before the intervention so normality of the sampling distribution could not be determined. No autocorrelation plots are provided because there is a lag of 0, indicating no correlation of past values exist. The moving average parameter was 2112.0, which is statistically significant, with $t = 40.15$, $p < .05$. The intervention parameter (30.44714) was not statistically significant, $t = 0.53$, $p < .05$. The impact of the implementation of MTSS/RTI for reading with students identified for special education reflects a decrease in

reading mean scale scores at the school level. With an average reading mean scale score of approximately 2112 before implementation, the overall decline is approximately 54 scale score points reflected in the final year of implementation, 2007-2008. Thus, the implementation as shown appears to be ineffective in improving school reading mean scale scores for students

Table 7

The ARIMA Procedure for Reading Scale Scores of Students in Special Education in Treatment Schools

The ARIMA Procedure

Conditional Least Squares Estimate

Parameter	Estimate	Approx Std Error	t-value	Pr > |t|	Lag
MU	2112.0	52.60962	40.15	< .0001	0
NUM1	30.44714	57.63095	0.53	0.6252	0

Constant Estimate	2112.033
Variance Estimate	2767.772
Std Error Estimate	52.60962
AIC	66.14926
SBC	65.73278
Number of Residuals	6

*AIC and SBC do not include log determinant

receiving special education.

To further validate findings, the comparison group findings of school level reading scale scores for students identified for special education were also analyzed using the interrupted time-series. The findings of the interrupted time-series on comparison schools, also seen in Figure 3, had only one year of data existing before the intervention so normality of the sampling distribution could not be determined. The autocorrelation results (AR 1,1) are provided (t = 1.90), indicating there is not a significant effect when scores are correlated with prior year

scores. The moving average parameter was 2075.1, which is statistically significant, with t = 19.44, $p > .05$. The intervention parameter (78.24685) was not statistically significant. The impact of not implementing MTSS/RTI for reading for students identified for special education was similar to the results for the treatment group, a decrease in school level reading mean scale

Table 8

The ARIMA Procedure for Reading Scale Scores of Students in Special Education in Comparison Schools

The ARIMA Procedure

Conditional Least Squares Estimate

Parameter	Estimate	Approx Std Error	t-value	Pr > |t|	Lag
MU	2075.1	106.74088	19.44	0.0003	0
AR1,1	1.00000	0.52723	1.90	0.1541	1
NUM1	78.24685	89.69871	0.87	0.4472	0

Constant Estimate	0.001897
Variance Estimate	3347.755
Std Error Estimate	57.85979
AIC	67.56465
SBC	66.93993
Number of Residuals	6

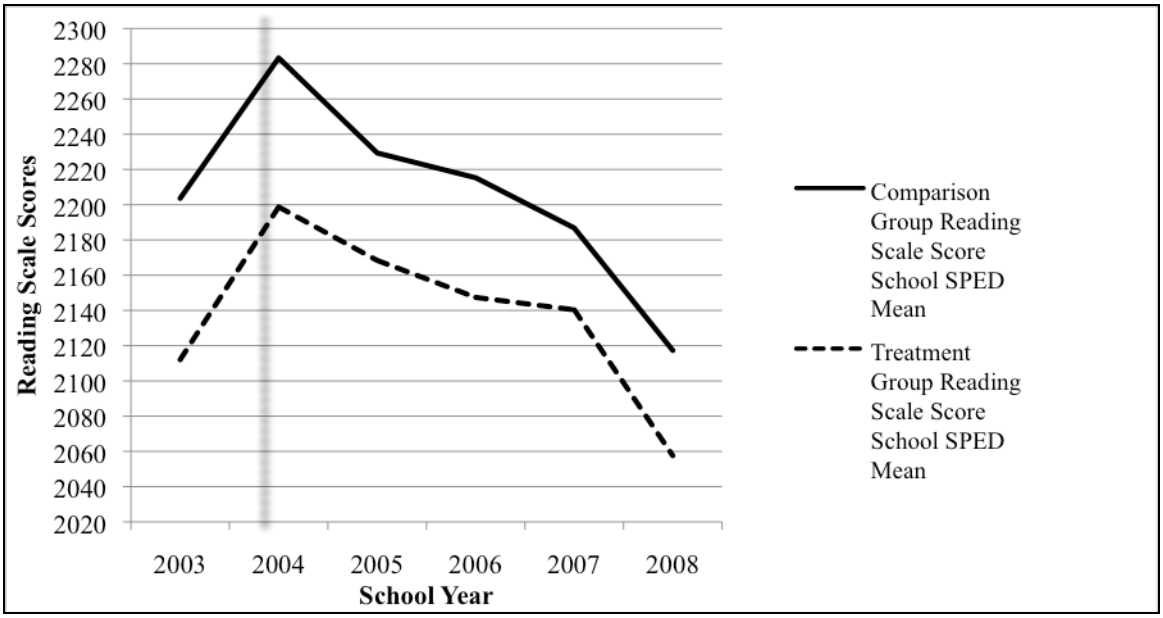
*AIC and SBC do not include log determinant

scores. With an average reading mean scale score of approximately 2204 before implementation, the decline is approximately 86 scale score points in overall comparison reading school mean scale score. Thus, the lack of implementation does follow the same pattern and effects of an abrupt, temporary impact. The implications for these results are discussed in Chapter 4.

Additional observable trends in the data indicate an abrupt initial increase in treatment school mean scale scores. Both treatment and comparison schools in the treatment group evidenced a peak in mean scale scores in 2004, the first year of district level implementation of

TRFI. Again, the year prior to the interruption, beginning, 2002-2003, was also the first year the TAKS test was administered, which may explain the lower scores overall in 2002-2003. While the comparison school mean scores remain above the treatment school mean scale scores, the narrowing of the gap in scores remains evident after several years of implementation in the

Figure 3. Interupted time-series analysis of school level reading mean scale scores for students idenitfied for special education.



treatment schools. Again, notably, while the treatment and comparison schools in this study are geographically and demographically similar, higher mean school scale scores in the comparison group reflect the selection process for schools participating in TRFI, since only schools identified as lower performing qualified to participate in TRFI. One additional observation reflected in Figure 3 is the continued decrease of school level mean scale scores for both the treatment and comparison groups over time for students identified for special education. However, the mean

school level reading scores for students receiving special education appeared to decline more slowly overall. These findings are further addressed in Chapter 4. The findings of the interrupted, time-series for the treatment schools suggest implementation of the MTSS/RTI for reading over time did not improve school level TAKS reading scale scores for students receiving special education.

CHAPTER 4: Discussion

This study investigated (a) the overall trends in student achievement of implementing MTSS/RTI for reading in a large, urban district and (b) the same trends for students receiving special education supports in the district. In this chapter the findings from this study and this relationship to findings reported in the literature on MTSS/RTI and school reform in urban districts are discussed. While the present study suggests district implementation of MTSS/RTI positively influenced overall reading growth as measured on the TAKS for all students, the reading results for only the subgroup of students receiving special education suggested otherwise. The discussion below highlights implications for policy, practice, and future research studies.

Implications for Policy, Using the Interrupted Time-Series Analysis

In the current educational system, schools are held accountable for the academic achievement of all students, including those identified for special education (McLaughlin & Rhim, 2007). The interrupted time-series design employed for this study also provided findings important to discussions surrounding accountability for students receiving special education and several implications of the findings of this study related to policy and accountability issues. Policy makers and district leaders constantly seek interventions with supporting research showing positive effects for all students and this research can assist in their search, as it contributes to evidence of the impact of implementing MTSS/RTI, through even further research is needed to distinguish trends in overall effects, especially targeting marginalized groups who remain a focus of policy makers and leadership. Also, districts need to further analyze results for those marginalized groups. If only the overall reading scale scores at the school level in a large

district are analyzed, a district might run the risk of overstating the impact for specific subgroups of students. Evidenced in this study, which narrows it's focus on only one subgroup students in special education, scores differed dramatically from the overall scores that included their performance. General and special educators alike must begin to understand the importance of including all students in accountability frameworks supporting a system where all students are subjected to the same standards and requirements (McLaughlin & Thurlow, 2003).

Analysis of the implementation effects on overall reading scale scores suggests a dip in scores after several years. Similarly, research from other sources suggests the occurrence of an implementation dip after several years (ie, Fullan, Cuttress, & Kilcher, 2005). Sustaining change in improving schools is a perennial problem. MTSS/RTI is not a quick fix or a temporary solution but is rather an opportunity for long-term change and development for schools valuing innovation and problem solving.

Another policy consideration addresses a need for a federal and state focus on results rather than curricula. Results of analysis of *Reading First Initiative* nationally do not reveal a statistically significant impact on student reading comprehension test scores in grades one, two or three (U. S. Department of Education, 2008). The present study revealed improvement overall in student reading scores in this district. It did not, however, determine whether the positive growth can be attributed to school level, district level, or state level variables, but these results are demonstrably atypical. Issues of contextual fit may be at issue here and as they can impact outcomes they should therefore be a focus of MTSS/RTI implementation (Hofman, Hofman, & Guldemond, 1999). For example, the *Reading First Initiative* was driven by a focus on the scientific findings of reading intervention results over a number of years highlighted by the National Reading Panel (Stern, 2008). It is how schools interpret and apply the supported

principles (ie, from TRFI in this study) in their own context that may influence effects. Schools need to have the ability to develop and select evidence and research based programs without prescription.

Finally, the present study utilized a comparative, interrupted time-series design and therefore differed greatly from the numerous other smaller studies on RTI effects. These intervention studies, often at the classroom or school level, are considered more scientific because of the use of randomized comparison trials and standard treatment protocols. However, 'scaling up' implementation further exposes the complexity of additional variables that must be considered (Fixsen, 2009). These variables are largely contextual, reflecting the differences within systems including, but not limited to: needs, environment, people, and resources. The use of the interrupted time-series design in this study did not aim to provide support for a specific implementation framework. Rather, it was designed to analyze effects of an existing MTSS/RTI implementation. However, it is important to note that a design with as many observations as possible is preferable for interpretation. As with this study, specific variables important in the implementation of MTSS/RTI are not easily identified and measured retrospectively however, some barriers and system issues can be discussed in connection with this analysis.

Implications for Practice, Improving Reading Outcomes for All Students

The results of this study showed that overall reading scale scores on state third grade standards-based assessments improved, and generally maintained this improvement, from before implementation to the end of the fifth year of implementation following MTSS/RTI implementation. While the results indicated significant growth in both the overall treatment and comparison groups, data further suggests the increase in scores was greater for the treatment group. Further, this study found that for schools in the treatment and comparison groups, mean

school level reading scale score outcomes for students receiving special education in this district decreased on the state third grade standards-based assessments. Also notable, the numbers of students receiving special education and taking the TAKS or TAKS A during the initial administration increased over time as MTSS/RTI was being administered. Not all students receiving special education in these schools in this district are reflected in this study. The literature review in Chapter 1 reported implementation examples concerning both academic and behavioral MTSS/RTI frameworks. This study concerned MTSS/RTI reading implementation only however, the discussion that follows considers these findings in light of current discussions of school reform, integrated supports for academics and behavior, and implementation research.

Literature reviewed in Chapter 1 suggested in general that MTSS/RTI has the potential to prevent future deficits in content area knowledge, such as reading and math, and to promote positive social-emotional and behavioral development for all students (Fuchs & Deshler, 2007; Gersten, Compton, Connor, Dimino, Santoro, Linan-Thompson, & Tilly, 2008; Justice, 2006; Klingner & Edwards, 2006; McIntosh, Filter, Bennett, Ryan, & Sugai, 2010; Newman-Gonchar, Clarke, & Gersten, 2009). For reading, the results of this study contribute to this evidence base. Additionally, literature had suggested that the implementation of an MTSS/RTI framework may decrease the number of students identified for special education (Wanzek & Vaughn, 2011). Unfortunately, this study cannot corroborate these findings. This study did not look at identification numbers and not all students receiving special education in these schools in this district are reflected in this study, as not all are administered these TAKS versions. With support for a hypothesis that MTSS/RTI effectively improves student academic outcomes for all students, implementation focused on reading on a larger scale has not provided much evidence to suggest that the prevention-focused reading models realize improved outcomes for all students.

As districts attempt to scale-up implementation of MTSS/RTI, barriers and issues with implementation of schoolwide reading initiatives become more clearly realized. Simmons and colleagues (2000) identified many even before findings of the *National Reading Panel Report* (NRP, 2000) were published and support for RTI appeared in legislation. Despite these challenges, for students receiving special education the literature suggests MTSS/RTI should improve outcomes, however the present study revealed a decline in reading scores for students receiving special education. Districts and schools implementing MTSS/RTI need ensure they have systems explicitly addressing the instructional needs of all students, especially those receiving special education. The cause of the decline in scores for student receiving special education in this study cannot be determined and warrants further study. Specifically, districts and schools need to continue to look more closely at their practices, inclusion, and instruction of students in special education (Tindal, 1985; McLeskey & Waldron, 2011) to understand their effectiveness.

Urban Schools. As a result of unique and diverse educational and implementation issues, urban schools have long been singled out for study and reform (Bryk, 2010; Edmonds, 1979). First, they are typically composed of a more multicultural student population with lower socio-economic status than rural and suburban schools (Massey, 2007). Second, the volatile nature of local reform (Elmore, 2004), and resulting teacher change fatigue (Morgan, 2001), threaten the sustainability of models focused on improving instructional practices (Blase & Blase, 2004; Fullan, 2007). As discussed in Chapter 2, the present large-scale, urban implementation effort was made financially possible through participation in TRFI. These findings from this large, urban district highlight several possible considerations for urban districts in general and policymakers working to reform schools utilizing MTSS/RTI to support improved reading

outcomes. Considering the unsustained improvement trend in reading scale scores for urban schools in the present study, several leadership and system change issues warrant examination: capacity building, planning, and innovation. The results of this study suggest initial implementation of MTSS/RTI for reading, which included attention to professional development, the incorporation of research-based reading instruction and assessments, and other key tenets as part of TRFI, produced gradual improvement. While implementation appparently resulted in only temporary, not permanent, improvement, additional data for continuing years is needed to confirm the trends in this interrupted time-series. Notably, the specific impact of professional development or research-based curriculum were not measured variables in this study, but should be in future studies.

Leadership. For schools considering implementation of MTSS/RTI, an initial essential consideration is a focus on instruction (City, Elmore, Fiarman, & Teitel, 2009; Elmore, 2004; Fullan, 2007). As previously discussed, the intervention in this study placed much emphasis on instruction and improving instruction, planning and supporting schools through targeted and focused professional development on reading (Knight & Michel, 2011). However, leadership -- state, district, or school level -- bears much of the responsibility to establish conditions that allow for the improvement of teaching and learning in schools (Bossert, Dwyer, Rowan, & Lee, 1982; Fullan, 2008; Hallinger & Heck, 1998; Spillane, Halverson, & Diamond, 2004). Moreover, the correlation of leaders knowledge and involvement with student academic achievement cannot be ignored (Marzano, Waters, & McNulty, 2005).

Initiatives are susceptible to failure when key leadership is changed (Elmore, 2004). In the study findings, a decline in overall school third grade mean reading scale scores for all students became evident in 2007, a time of leadership transition, suggesting a possible

connection with documented key administrative and leadership changes at the school and district level. For sustainability, and to prevent oscillation (Sailor, 2009b), a large number of stakeholders need to be knowledgeable about practices for continued support of an initiative. Capacity building through practice and support of professional development should continue (Burrello, Hoffman, & Murray, 2005; Copland, 2003; Fullan, 2008; Vaughn, et al., 2008). Another possible explanation for the temporary success of the implementation of MTSS/RTI on reading scores in the treatment group in the present study is the continuation and importance placed on professional development as part of the initiative. The changes in leadership may have affected the focus and quantity of professional development centered on improving instruction.

Structural and Systems Issues. Another important consideration to address before attempting to implement a school reform initiative, such as MTSS /RTI for reading, is a school or district's structural issues and dynamics (Burrello, et al., 2005; Desimone, 2002; Elmore, 2004). Leadership should maintain focus on instructional practices by promoting frequent discourse among stakeholders, including both general and special education teachers, and revisiting core purposes with all staff during professional development and classroom supports. Real change occurs at the level of the teachers and administrators in a school (Fullan, 2001) and consideration should be given to issues of contextual fit, meaning problem solving systems should be based on the needs and capacity of schools, students, and teachers. To determine fit and identify needs prior to implementation a school might, for example, choose to complete a reflective evaluation tool or survey, such as the one provided in Marzano, et al. (2005). In this study, decisions outlining the key foci and non-negotiables for participation in the initiative were made at the district, state, and federal levels (Stern, 2008), and they were, therefore, outside the jurisdiction of the individual schools. The mean scale scores of individual schools at the

beginning of this study reflect different levels of reading mastery and therefore a possible need for considering different approaches, plans, and professional development. The information provided to conduct this study did not include specifics about professional development or individual school implementation plans. Therefore, discussion of the impact professional development or TRFI program adherence and fidelity in the present study is impossible. Essential components (Bryk, 2010), organizational features (Skrtic, 2003), and supports within effective models (Sailor, 2009b; Sailor and Roger, 2005) abound in the literature. One widely supported recommendation suggests improved implementation by increased conversations and relationships with all stakeholders including district personnel, community members, parents, faculty, and staff on each campus (Sailor, 2009b). Also, research reveals that educational change can be inhibited when the infrastructure supporting an initiative is weak or has conflicting strategies, goals, or motivations for change (Fullan, 2007). Further implementation impact can be affected when only cosmetic changes in the organization of a school are occurring (Skrtic, 1995). Considering the established top-down approach of the initiative examined here, the danger of a school adopting only cosmetic changes is great. The results of the study may not reflect implementation of a MTSS/RTI that has been fully enculturated. Future studies would be enhanced by inclusion of a measure of fidelity that includes attention to all of these school-level factors.

Stakeholder contribution, buy-in by staff, and development of a shared vision are also essential for all initiatives directly related to improved student outcomes. Sufficient time should be allotted for planning and discussing any new initiative. Professional development is essential (Burrello, et al., 2005; Desimone, Porter, Garet, Yoon, & Birman, 2002). Use of an instructional coach, as in the district in this study, has been shown to offer promise for improving literacy

outcomes (Biancarosa, Bryk, & Dexter, 2010; Knight & Cornett, 2009; Marsh, Sloan McCombs, Lockwood, Martorell, Gershwin, Naftel, et al., 2008). Schools, districts, and states should not overlook the effect of structural and systems issues.

Academics and Behavior Supports. Addressing both academic and behavioral objectives offers an alternative to the academic only MTSS/RTI implementation. One example discussed in Chapter 1, the Schoolwide Application Model (SAM), offers evidence of effective implementation considerations for both academics and behavior (Sailor, 2009b). SAM, an example of an MTSS/RTI framework, requires professional development and knowledge of universal, secondary and tertiary academic interventions as well as positive behavioral interventions and supports, with education of all students in the general education classroom. A few early studies on integrated models were identified and supports discussed in Chapter 1, but continued research and a more detailed focus on such models is needed. Moreover comparison of results from this study focused only on reading with examples from large-scale implementation of integrated models may provide more information to support schools, districts, and policymakers in making decisions concerning the support of various MTSS/RTI approaches.

While the link between academics and behavior continues to be further explored, schools have not been supplied with an evidence base supportive of both academic and behavioral MTSS/RTI implementation. The utilization of combined or integrated academic and behavioral instruction, interventions, and systems offers promise to educators who desire to find ways to better address the needs of all students.

Improving Instruction and Outcomes for Students Receiving Special Education. The lack of improvement for students identified for special education in both the treatment and comparison groups raises many additional questions. Why do the scores for students receiving

special education in both the treatment and comparison groups not improve during the last four years of the study? While the MTSS/RTI framework specifically addressed reading instruction for special education K-12, the decreasing scale scores may indicate a lack of participation or integration of general and special education services. It may also be an indication that the scores of students continuing to receive special education following several years of implementation reflect a reduction in overall students identified with SLD included and/or a large number who were exited from special education during that time period. Further, learning disabilities occur concomitantly with linguistic differences (Ortiz, 1997), so nonnative English speakers may have been over-represented in the special education subgroup. Unfortunately, these issues could not be addressed within the current study but will be important considerations for future research.

The findings regarding students in special education are similar to those in a study conducted by Drame (2010), which found that when students with disabilities were assessed using a standardized test, they did not appear to perform well in either reading or math. A standardized test was used in the current study. Conversely, additional research suggested that teacher participation in a multi-year, professional development effort produced increased scores on standardized tests (Shymanksy, Wang, Annetta, Yore, & Everett, 2010). Professional development was a large part of the TRFI initiative in this study. The data in this study does reflect all students identified for special education participating in the third grade TAKS reading assessment and while the trends are similarly decreasing in both treatment and comparison groups, the data suggest the decrease is less extreme in the treatment group. Regardless, the scores are low for students receiving special education. These contradictory explanations indicate a clear need for more research regarding MTSS/RTI impact on students receiving special education.

Implications for Future Research and Practice

This exploratory study of effects of MTSS/RTI has provided significant insights into trends within one large, urban district. The practice of comparing geographically and demographically similar treatment and comparison groups suggests success initially for schools in the treatment group. However, this analysis has produced additional questions about the factors that explain the trends and of sustaining progress after three years of implementation. Replication of this study with archived data from other large, urban districts coupled with additional analyses with this data set using multi-level modeling methods may help to overcome some limitations addressing issues of student level changes. Modeling can take into account individual student scale scores and the data obtained for this study do contain nested student and teacher variables making the overall database ideal for path modeling. Further explanation may also be gathered through continued studies of school instruction and district level implementation (Deshler & Cornett, 2011), access to general education curriculum for students with disabilities (Schumaker, Deshler, Bulgren, Davis, Lenz, & Grossen, 2002), case studies (Callender, 2007), reviews of policy and guidance documents (Zirkel & Thomas, 2010), and the translation of policies into practice (Batsche, et al., 2005; Walker & Daves, 2010).

In the current political climate, with much focus on expanding the evidence base for school practices, the growing presence and use of MTSS/RTI requires further study. Further difficulty lies in scaling up the practices and supports and creating systems on a deeper level and with increased numbers (Fixsen, 2009. The growing field of implementation science seeks to find explanations of effective implementation features and identify barriers to support school, district, state, and federal initiatives relying on MTSS (Fixsen, et al., 2005). Research suggests

that successful schools sustaining implementation of MTSS/RTI thrive because they have developed strengths in understanding their data, selecting effective, targeted interventions and programs, and collaborative, problem-solving approaches persevering with innovations to their framework, driven by context specific needs and goals (Bryk, 2010; Elmore, 1996; Sailor, 2009a; Sailor, 2009b). The future of successful MTSS/RTI implementation will be dependent on the professionals conceptualizing them for practices and contributing to them in their own environments. One possible improvement area suggested in recent literature recommends addressing both academics and behavior instruction in MTSS/RTI however the limitations cannot be ignored. The most consequential of these limitations is the lack of large-scale randomized group studies. In the absence of these studies, the importance of addressing behavior as part of a school's multi-tiered support model may be overlooked. Researchers need to continue working to document this connection and collect both academic and behavioral outcome data regardless of the emphasis of the study. Moreover, researchers interested in integrated approaches should consider large-scale, randomized comparison studies to further increase the evidence base for this approach. Finally, when schools are considering the application of a multi-tiered system of supports for academics or behavior, they might also consider a combined, or even integrated, approach. Continued documentation of a relationship between problem behavior and academic achievement is needed to support integrated academic and behavioral MTSS/RTI frameworks offering promise as a further improved model (Lassen, Steele, & Sailor, 2006).

Limitations

In addition to the difficulties in implementing MTSS/RTI on a large scale in urban districts, difficulties also exist in conducting research to determine effectiveness. Longitudinal

data is needed for better understanding implementation and impact. Urgency exists, and schools, districts, states, and policy makers need more information to support implementing MTSS/RTI. The use of archived data in this study offers one solution for beginning to understand effects of early MTSS/RTI implementation on student academic outcomes. However, this study cannot determine whether trends similar to the one reported in this study exist today.

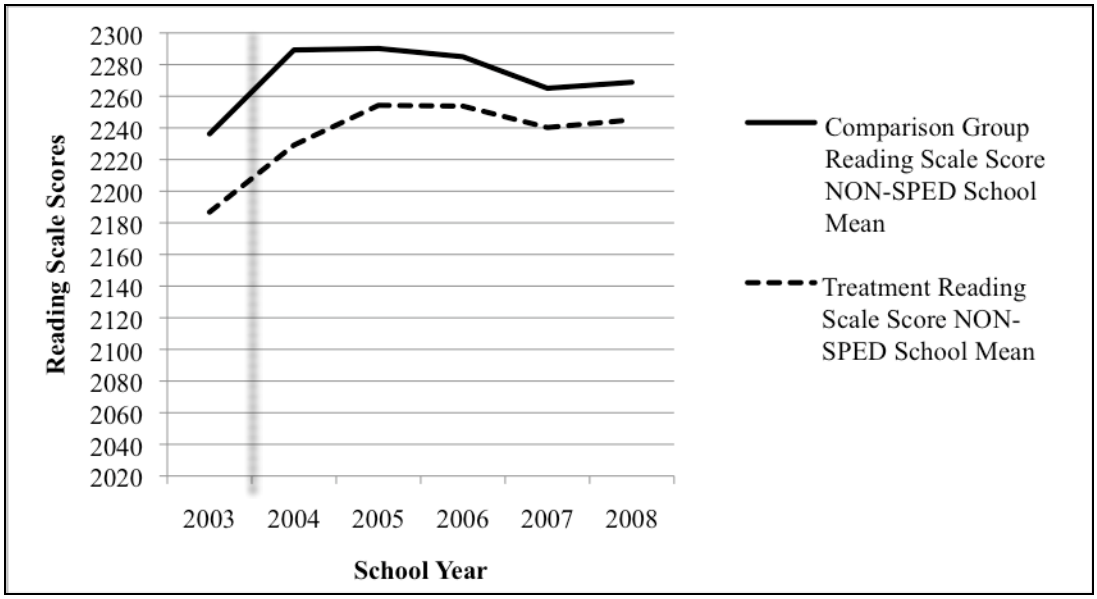
Low Number of Observations. A number of other limitations exist concerning the analysis and findings of this study. First, the design has a relatively low number of observations over time. Over 50 observations are recommended for time-series analysis (Shaddish, et al., 2002). For this study only six observations were available. Some researchers suggest this is adequate enough for measuring intervention impact (Orwin, 1997). However, this can lead to large standard errors, with estimates less reliable than they appear. The small number also limits interpretation of R^2 therefore it is not reported in the analysis. Additionally, time-series analysis findings are susceptible to problems with serial autocorrelations within estimates of error variance however, this was determined not to be a real threat in this study because the cases (32-treatment, 30-comparison) reflect a higher number than the number of time points (6) in the analysis (Beck and Katz, 1996). However, the purpose of this study was to inform policy and practice, and interrupted time-series remains a reputable choice for short-term forecasting in intervention studies (Orwin, 1997).

The School as the Unit of Analysis. A major limitation of this study is the unit of analysis. To conduct the interrupted time-series analysis, the unit of analysis must remain constant over the course of the study. To conduct this study, the school level had to become the unit of analysis. Using the school as the constant unit of analysis is problematic. While it does remove the possibility of outliers, it also greatly reduces all the variability between students and

schools. When considering future studies, there are other ways to address the student level data that are suggested above regarding future research.

Possibility of High Type 1 Error Rate. Another limitation of this study concerns the difficulty of comparing students receiving special education and students not receiving

Figure 4. Graphical representation of school level reading mean scale scores for students not identified for special education.



special education using interrupted time-series because higher type 1 error rates can result by running several models separated by types of students (e.g. special education, all, and only students not receiving special education). Figure 4 above provides graphic representation of trends in scale scores for all students not receiving special education. This was created as a secondary analysis to attempt, in an effort to further understand the different results between the analysis of all students and students receiving special education. Because the current study sought to review overall trends as well as trends in special education, it therefore did not account for separate effects when students receiving special education were removed, possibly leading to

type 1 errors, false positives. Figure 4 also suggests results conflicting with those of the current study. For students not receiving special education the trends for both treatment and comparison groups are more similar and reflect trends of sustained improvement, with only a small decrease in 2007 for both.

Model Adherence and Fidelity Verification. Determining the level of fidelity to an implementation framework at the school level is almost impossible, especially in large, urban districts where teacher attrition rates are high (Guarino, Santibanez, & Daley, 2006) and for this study utilizing existing data. Finding key stakeholders to confirm participation or outline key tenets of implementation with certainty for activities almost a decade old is difficult. To overcome this obstacle, confirmation of adherence to a MTSS/RTI model was largely overcome by selection of a district implementing a clearly defined initiative administered and supported at the state level. Further, documents provided details about the implementation and when combined with email and personal contact, school implementation fidelity for MTSS/RTI were collected using the Treatment Fidelity Scale (Appendix A).

Using Archived Data. Lastly, limitations exist when using archived data (Shadish, Cook, & Campbell, 2002). Archived data is not flexible and may not include additional variables that could be potentially helpful in analysis. For example, identifying further identify barriers to implementation present in the district, such as leadership turnover, teacher attrition, and planning (Fixsen, et al., 2005; Klingner, Ahwee, Pilonieta, & Menendez, 2003) would have strengthened the findings. Another example of the problems with inflexibility of archived data is evidenced by lack of additional information about the identification rates of students with disabilities and variables reflecting the exit of students from special education during the intervention time period. Luckily, issues concerning the use of archived data and the explanation of the variables,

sometimes contributing to a lack understanding the definitions of key terms and analysis, were not a problem in this study. When working with the identified district to collect the data outlined in the design, a data analyst provided written and verbal explanations of the variables.

Conclusion

The findings of this study suggest continued support of the implementation of comprehensive, research-based, reading-focused MTSS/RTI for improvement in overall reading achievement in an urban district. However, caution should be exercised in interpreting this suggestion. Greater attention to the instruction and reading outcomes for students receiving special education is needed in future studies and implementation efforts to better understand the unexpected results for this group in the study. Equity in the resources, supports, instruction, and environment will need to be examined to improve outcomes (Darling-Hammond, 2010).

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Appendix A

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3-Tiered Reading Model Treatment Fidelity Rating

Please rate the following areas to determine the fidelity of treatment in grades K-3 at the identified schools. This rating scale is used to determine the adherence, or level of adherence, to a 3-tiered reading model as part of the Texas Reading First initiative during 2002-2007. The timing of the implementation of the features should not affect the rating, as the full implementation occurred at different times on different campuses. Document review (DR), email (E), phone (P), or personal contact (PP) with school personnel can be used to support the rating. Indicate the method(s) used.

Using the following scale, circle the number that most closely matches your opinion about the fidelity of treatment at _____ Elementary School.

0-there is evidence to support this feature was not being implemented
1-there is evidence to support this feature was being implemented somewhat
2-there is evidence to support this feature was being implemented

Common Features of the 3-Tiered Reading Model Implementation

Was a reading coach assigned to support implementation of a 3-tiered reading model? Did the reading coach attend regular meetings and provide professional development?

0	1	2	DR E P PP

Was a scientifically-based reading program selected for use for Tier 1, universal instruction for 90 minutes a day?

0	1	2	DR E P PP

Was a school-wide progress monitoring assessment, or assessments, administered for students receiving Tier 1 instruction and more frequently for students receiving Tier 2 and Tier 3 instruction?

0	1	2	DR E P PP

Did the school provide intervention instruction to students identified as needing additional instruction using screening and progress monitoring data? Were evidence-based interventions available for use on the campus?

0	1	2	DR E P PP

Were three increasingly intense tiers/levels of instruction provided in grades K-3?

0	1	2	DR E P PP

Did the school participate in the Texas Reading First initiative, thereby receiving funds and instructional support through the Texas Reading First initiative?

0	1	2	DR E P PP

Were teachers provided professional development in the implementation of a 3-tiered reading model and reading related skills and strategies? Were teachers, administrators, and other school personnel trained in how to develop and implement teaching plans to directly and formally teach students reading skills and/or strategies through consistent prevention focused teaching?

0	1	2	DR E P PP

Additional comments regarding the 3-Tier Reading Model implementation on this campus:_____

_____

_____

_____

_____

Scale adapted from "Effectiveness of school-wide positive behavior support in two urban schools," By A. McCart, 2003, Unpublished dissertation.

3-Tiered Reading Model Control Fidelity Rating

For schools in the control group, verification of lack of participation in the Texas Reading First initiative, and thereby the 3-Tiered Reading Model, is needed.

Document review (DR), email (E), phone (P), or personal contact (PP) with school personnel can be used to support the rating. Indicate the method(s) used and when applicable, the name of the school level contact providing verification.

Participation 3-Tiered Reading Model Implementation

Was this school implementing a 3-tiered reading model in grades K-3 from 2002-2007?

YES	NO	DR E P PP

Additional questions that can be asked to determine participation:

Was a reading coach assigned to support implementation of a 3-tiered reading model? Did the reading coach attend regular meetings and provide professional development?

Was a scientifically-based reading program selected for use for Tier 1, universal instruction for 90 minutes a day?

Was a school-wide progress monitoring assessment, or assessments, administered for students receiving Tier 1 instruction and more frequently for students receiving Tier 2 and Tier 3 instruction?

Did the school provide intervention instruction to students identified as needing additional instruction using screening and progress monitoring data? Were evidence-based interventions available for use on the campus?

Were three increasingly intense tiers/levels of instruction provided in grades K-3?

Did the school participate in the Texas Reading First initiative, thereby receiving funds and instructional support through the Texas Reading First initiative?

Were teachers provided professional development in the implementation of a 3-tiered reading model and reading related skills and strategies? Were teachers, administrators, and other school personnel trained in how to develop and implement teaching plans to directly and formally teach students reading skills and/or strategies through consistent prevention focused teaching?